Review of Depot and Base Levels for Low Density/High Reliability Items

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EXECUTIVE SUMMARY

PROBLEM STATEMENT:

Headquarters Air Force Communications Agency (AFCA) asked us to review the policies used to establish wholesale and retail stock levels on communications-electronics (C-E) items to determine if the existing worldwide requirements can and should be reduced. Specifically, can the depot floor of two be reduced for some or all C-E items? And, can the base Peacetime Operating Stock level be reduced if there is another base source (e.g., a Readiness Spares Package level) for the item.

OBJECTIVES:

1. Determine if base and depot levels on low density/high reliability items can be reduced without hindering mission support.
   a. Identify and test alternative depot floor policies.
   b. Identify and test alternative base stockage policies.
2. Recommend changes to existing policy if appropriate.

ANALYSIS/RESULTS:

Using data from the Readiness Based Leveling (RBL) system, we analyzed failure probabilities of low density, high reliability spares to determine if base and depot levels could be reduced. Our results indicate modifying the policy (on selected items) has the potential to reduce net buy and repair requirements (a cost avoidance) by approximately $48M at virtually no risk of creating a worldwide stock out condition. Our proposal requires changes to the Standard Base Supply System, the Readiness Based Leveling System and the Recoverable Consumption Item Requirements System (D041).

CONCLUSIONS:

1. Reducing the depot floor from two to one on selected communications-electronics items could reduce the gross requirement by approximately $113.2 million with little, if any, affect on mission capability of supported systems.
2. Reducing the base peacetime operating stock level by one on selected communications-electronics items with base readiness spares authorizations could reduce the gross requirement by approximately $10.3 million with little, if any, affect on mission capability of supported systems.
3. The RBL data feed (XCB) should be modified to include readiness spares package (and other additive) levels.
4. The Air Force needs a reliable automated method of passing computed communications-electronics item requirements from RBL to D041.
5. Additional requirements reductions may be possible by centralizing base stock levels for selected low demand, high application items.

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CHAPTER 1

INTRODUCTION

BACKGROUND

In this study we analyze a centralized leveling policy for low-density, high-reliability spares. These spares, commonly called Communications-Electronics (C-E) spares, are low-density spares used on communications, missile, space and other high-reliability systems. The supply policy governing these spares is managed by the Air Force Communications Agency (AFCA). These spares support essential C-E systems whose down time must be kept to a minimum. The limited numbers of these spares, combined with the criticality of the systems they support pose a special problem: how should levels for these spares be determined to maximize system availability?

AFCA divided these items into four classes, single point failure (SPF), operational readiness parts (ORP), joint transfer agreement (JTA), and non-single point failure (NSPF). SPF items are mission essential items supporting C-E systems that cannot be inoperable for more than 48 hours. ORPs support C-E systems required to maintain maximum redundant capabilities or one-of-a-kind systems and are authorized prepositioning based on various conditions (unit's unique location or limited worldwide inventory). C-E spares that are used by more than one service and are pre-positioned by the Joint Chiefs of Staff agreement are referred to as JTA items. NSPF items are those C-E items not designated as SPF, ORP or JTA.

Then AFCA developed a regionalization stockage policy for these items. The Air Force Supply Executive Board approved the AFCA recommendation and instituted the following regionalization policies: 1) Stock SPF items at every using base and have a minimum of two serviceable spares at the depot. 2) Stock operational readiness parts at base level per MAJCOM determination based on mission and equipment configuration and have a minimum of one serviceable spare and one unserviceable spare at the depot. 3) Stock NSPF items only at bases with three or more demands and have a minimum of one serviceable and one unserviceable spare at the depot. 4) Stock Joint Transfer Agreement items at each using base and have a minimum of one serviceable and one unserviceable spare at the depot. The policies' intention was to enable depots to rapidly replace used spares at the retail level and induct parts into repair. For SPF items, two serviceable spares at the depot are meant to ensure supply support within 48 hours. Once a failure occurs, the base sends the unserviceable carcass back to the depot and the depot releases a serviceable spare to fill the hole on the base's shelf.

AFCA developed a centralized means of managing the levels for C-E spares. Instead of simply approving or disapproving adjusted stock levels (ASLs), AFCA built a database of levels for all non-demand based C-E spares. This database currently serves as the source to input C-E ASLs into the Readiness Based Leveling (RBL) database. Each quarter, an updated AFCA database is used to create a new input file for RBL. The AFCA levels are then pushed by RBL to using bases. AFCA

plans to delete all C-E ASLs at retail supply accounts, completing the transfer to centralized management of these levels. The benefit will be greatly improved accuracy in this major portion of the ASL database and greater flexibility in support.

Most C-E items experience little or no demand, so expected failures over a re-supply time are very little or non-existent. Given that the probability of one failure is small for many C-E items there is potential to reduce wholesale stock levels based on limited worldwide failures within a re-supply time. At the retail level, some C-E items are stocked in peacetime operating stock (POS) and in a readiness spares package (RSP). In these cases there is potential to reduce the base POS level by one if they use their RSP stock level to satisfy their POS failures.

PROBLEM STATEMENT

Headquarters Air Force Communications Agency (AFCA) asked us to review the policies used to establish wholesale and retail stock levels on communications-electronics (C-E) items to determine if the existing worldwide requirements can and should be reduced. Specifically, can the depot floor of two be reduced for some or all C-E items? And, can the base POS level be reduced if there is another base source (e.g., an RSP level) for the item.

STUDY OBJECTIVES

1. Determine if base and depot levels on low density/high reliability items can be reduced without hindering mission support.
   a. Identify and test alternative depot floor policies.
   b. Identify and test alternative base stockage policies.
2. Recommend changes to existing policy if appropriate.

CHAPTER 2

ANALYSIS

Overview:

We divided our analysis into four parts. In the first part we analyzed the impact of reducing the minimum depot stock level (also known as the depot floor) for *selected* C-E items from two to one. In the second part we analyzed the impact of decreasing POS levels at bases authorized a POS level ***and*** a level in a RSP (or some other additive kit). Part three documents the net buy and repair requirement reduction (cost avoidance savings). In part four we discuss implementation issues.

Data Sources:

We used the October 1999 RBL Central Leveling Summary (CLS) to identify C-E items and provide base-level requisitioning objective data, latest acquisition cost figures, and other data. Air Force Materiel Command provided D035C (Recoverable Assembly Management Process) files containing base RSP levels. Logistics Management Institute personnel used March 1999 Consolidated Secondary Item Stratification (CSIS) data to provide an estimate of the net buy and repair requirement reduction (potential cost avoidance) resulting from decreasing C-E levels.

PART ONE: Can the depot floor be reduced by one?

First we determined the overall number of C-E items in the RBL CLS. Table 2-1 reflects C-E items in RBL by type and designated item code (DIC).

TYPE	DIC	NUMBER OF ITEMS
Single Point Failure Items	1	4,859
Operational Readiness Parts	2	4,783
Joint Transfer Agreement Items	3	313
Non-Single Point Failure Items	4	15,116
OVERALL TOTAL		**25,071**

Table 2-1. Number of C-E Items in RBL CLS.

Next, we identified how many of the 25,071 items had a positive base requisitioning objective (RO). We reasoned that if an item is not stocked at base level, then the depot floor policy is basically the policy the Air Force has on insurance items. That is, the worldwide POS requirement should be two (the same as the depot floor).

We used the RBL database to select only C-E items with a positive RO at base level. This identified 39 percent of the items (9,836/25,071). That means we did not use 61 percent (15,235/25,071) of the total C-E items in our analysis; there are no base levels, therefore the depot floor should remain two.

Before we completely dismissed the 15K C-E items with no base RO, we checked the impact of reducing their depot level from two to one. Basically there was little impact. Although the gross requirement reduction amounted to $146.8M, only 60 stock numbers did not have sufficient assets to satisfy the requirement of two. Reducing the requirement from two to one would result in a buy requirement reduction of only $.9M. So for the most part there are sufficient assets to meet the depot floor of 2 for these 15K C-E items with no base RO.

Next, for part one of our analysis, we subtracted items assigned a Noncomsumable Item Materiel Support Code (NIMSC) 5. These items are not stocked at Air Force depots so therefore there is no floor to reduce. There were 1,244 NIMCS 5 items, so that brought our total number of candidate items down to 8,592.

So for part one of our analysis, 8,592 C-E items are stocked at various Air Force depots and are also allocated a base level. Our theory is items stocked at base level could serve as a source of (lateral) support in the event a depot level of one is insufficient to meet all demands within a re-supply pipeline. That is, the Air Force could use lateral support if an item experienced two or more failures within its depot repair cycle time (RCT). We focus on ***only these 8,592*** items in part one of our analysis.

To establish a baseline dollar value from which to determine potential *gross* requirement reductions, we totaled the latest acquisition cost (LAC) of all 8,592 items. The total came to $126.7 million. We use this figure ($126.7M) as the baseline to determine ***potential*** *net buy and repair requirement reductions* realized by reducing depot stock levels.

For these 8,592 items we calculated the probability of each item experiencing two or more failures worldwide within its depot RCT. We use two or more failures as our criteria because if there were only two serviceable assets available in the worldwide inventory (one at the depot and one in the field), more than two failures in an item's depot RCT would result in a worldwide stock-out condition. That is, a third failure in the same time period would result in the supported system being inoperable until the responsible repair facility completed repair actions on one of the two unserviceable items and shipped a serviceable item to the base.

We separated the results of our probability calculations into five categories: items with 0 percent (0 to .00499999) probability of two or more failures; items with five percent (.5499999) or less probability; items with 10 (.10499999) percent or less probability; items with 15 percent (.15499999) or less probability; and items with more than 15 percent (.1450) probability. The results are shown in Table 2-2.

We also computed the potential gross requirement reduction of each probability category. We arrived at our potential gross requirement reduction estimate by summing the LAC of all items in each probability category. Note our estimated gross requirement reductions are based on the *assumption* that a policy change would prevent procurement of assets. But in reality, some items already have two assets at the depot and thus a policy change would not result in immediate procurement, but rather

repair requirement reductions and future procurement reductions (cost avoidance savings). The estimates reflected in Table 2-2 are only **potential** gross requirements reductions.

Probability of 2 or More Failures	Number of Items	Potential Requirements Reduction (LAC Total)
0%	6,832 (80%)	$95.0M (75%)
Less than or equal to 5%	7,634 (89%)	$109.3M (86%)
Less than or equal to 10%	7,840 (91%)	$113.2M (89%)
Less than or equal to 15%	7,985 (93%)	$115.6M (91%)
More than 15%	607 (7%)	$11.0M (9%)
TOTALS	**8,592 (100%)**	**$126.7M (100%)**

Table 2-2. Potential Requirement Reductions by Probability Category.

Data in Table 2-2 highlight that 80 percent (6,832/8,592) of C-E items *with a positive RO at base level* have ***less than one-half of one percent*** probability of experiencing two or more failures within an item's depot RCT. That means the Air Force has (or will have if current policy remains unchanged) a depot level of two on 6,832 items that have virtually no chance (at least based on historical data) of two or more failures at the same time. Reducing the depot floor by one on this group of items would capture 75 percent ($98.5M/$126.7M) of the total potential gross requirements reduction. As the probability of two or more items failing increases, the number of items eligible for depot stock level reduction also increases which expands the potential gross requirement reduction.

So the failure probabilities in Table 2-2 indicate many C-E items with a positive base RO do not need a depot stock level of two. The majority of items have little chance of needing two or more assets during their respective depot RCT. Therefore, we need a business rule to identify which items should continue under the current stockage policy and which items could receive effective supply support with a depot floor of one.

To help define the business rule we determined if two assets worldwide (one at the depot and at least one at a base) would be sufficient to satisfy the expected number of failures. To do this we computed the probability of experiencing ***three or more failures*** within an item's depot RCT. We performed this computation in each probability category ***regardless of the item's total worldwide base-level RO*** in RBL. Then we identified all items in each probability category that had a three percent or greater chance of experiencing three or more failures. Potentially, three or more failures would result in at least one C-E system being inoperable for an extended period of time (a depot RCT), which is not acceptable.

For items that had a three percent or greater probability of three or more failures we checked each item to determine if it had **a total worldwide base-level RO of two or greater** in RBL. Two or more worldwide POS assets at base level increases the worldwide stock level to at least three (two at base-level and one at depot-level) and therefore ensures three failures during an item's depot RCT could be filled from existing worldwide serviceable stock. The results are illustrated in Table 2-3.

Probability of 2 or More Failures	Number of Items with Probability of 2 or More Failures	Number of Items with 3% or Greater Probability of 3 or More Failures		
		Number of Items Regardless of R/O	Number of Items with Total Worldwide Base-Level R/O of 2 or Greater	Not Covered by Base-Level Assets
Less than or equal to 5%	7,634	0	0	0
Less than or equal to 10%	7,840	3	3	0
Less than or equal to 15%	7,985	102	78	24

Table 2-3. Number of Items with 3% or Greater Probability of Three or More Failures.

Data in Table 2-3 illustrate that of the 7,634 items with less than or equal to a five percent chance of two or more items failing during the same period, none of the items have a three percent or greater probability of three or more failures. Therefore, based on their demand history, these 7,634 items have less than a three percent chance of experiencing more failures than there are existing stock levels (with a depot level of 1).

Note, of the 7,840 items in the 10 percent or less category only three items have a three percent or greater probability of three or more failures. All three of these items have enough assets in the worldwide inventory to cover a third failure. Two of the items are SPF items that have worldwide base-level ROs of 28 and 83. The third is a NSPF item that has a worldwide base-level RO of three (one at Laughlin Air Force Base, one at Grand Forks Air Force Base, and one at Selfridge Air National Guard).

Going a step further, there are 102 items in the 15 percent category that have a three percent or greater probability of three or more failures. Of these 102 items, 78 have a total worldwide base-level RO of two or more in the RBL database. This means 24 items have at least a three percent chance of experiencing a worldwide stock-out condition because there is not enough *worldwide stock* to cover three demands within the same time frame.

By comparing the estimated gross requirement reduction and the potential risk of a worldwide stock-out condition in each probability category we concluded items with 10 percent or less probability offer the most gross requirement reduction potential at little or no risk. By reducing the depot floor for items in this category, 91 percent (7,840/8,592) of the items with a positive base RO would experience a reduction in depot stock by one. This reduction in depot stock would capture 89 percent ($113.2M/$126.7M) of the potential total gross requirement reduction.

Basically, we achieve 89% of the gross requirement reduction at virtually no risk (less than three percent chance of worldwide shortage of serviceable assets on any item). Therefore, our proposed depot stockage rule is to **reduce the depot floor to one on items that have a positive base-level RO**

and whose probability of experiencing two or more failures in their depot RCT is less than or equal to 10 percent.

When we discussed the above recommendation with AFCA personnel, they expressed concern regarding reducing depot levels on ***all*** items that met the 10 percent or below rule. Their biggest concern was reducing levels on SPF and ORP items that met the 10 percent or below rule. They wanted additional reduction estimates at lower failure probability levels for SPF and ORP items and NSNs of items meeting the reduced probability criteria. They used the NSNs to review specific systems and bases that would be impacted by the proposed reductions. Therefore Appendix A contains a few tables outlining options leading up to our proposed policy.

AFCA personnel also suggested another study to explore centralizing base stock levels for selected low demand, high application stock numbers. For instance (examples provided in Appendix A, Tables A-5 and A-6), some items have base level ROs totaling from 4 to 32 with an annual expected demand of 0 or 1. Perhaps some bases' stock could be consolidated, at a transportation hub such as Memphis Tennessee, to provide 48-hour response coverage. We agree a study should be conducted to review the cost and mission impact of consolidated stocking of selected items. The study should also include policy and procedures to ensure efficient operation. For example, develop criteria to determine the total number of items to be centrally stocked, identify criteria for determining which items to centrally stock, and define how AFCA can ensure serviceable stock at the central stockage location.

PART TWO: Can an item's base POS level be reduced if the item is authorized in a readiness spares package (RSP) (or some other additive kit) at a base?

We referred back to our file of 9,836 C-E items with a positive base-level RO. From this file we removed all joint transfer agreement items (313) from consideration, since base levels on these items are mandated by the Department of Defense Joint Transfer Agreement.

Next we identified the number of national stock number (NSN) and stock record account number (SRAN) combinations for C-E items with a positive base-level POS ***and*** a positive RSP authorization at the same base. Since one stock number is used at several bases, the number of NSN/SRAN combinations (943) is much higher than the actual number of C-E items (NSNs) involved (468). Table 2-4 shows the number of NSN/SRAN cases that currently have both a POS and RSP level.

Type Item	NSN/SRAN Cases
Single Point Failure Items	328
Operational Readiness Parts	242
Non-Single Point Failure Items	373
OVERALL TOTAL	**943**

Table 2-4. NSN/SRAN Cases of C-E Items with Positive Base POS and RSP Levels.

To establish a baseline dollar value from which to determine potential gross requirement reductions, we totaled the latest acquisition cost of all 943 cases. The total came to $22,948,107. We use this total as a baseline to determine potential gross requirement reductions realized by reducing base POS levels.

For these 943 cases we calculated the probability of each item experiencing one or more failures at a base within the item's base re-supply time. We use one or more failures as our criteria because if there were only one serviceable asset available at the base (one in RSP), more than one failure in an item's re-supply time would result in a stock-out condition at the base. That is a second failure in the same time period would result in the supported system being inoperable until a serviceable asset arrived from another source.

This time we separated the probability calculations into six categories: cases with zero percent (.00499999) probability of one or more failures; cases with one percent (.01499999) or less probability; cases with two percent (.02499999) or less probability, cases with three percent (.03499999 or less probability; cases with four percent (.04499999) or less probability and cases with more than four percent (.0450) probability. The results are shown in Table 2-5.

Probability of 1 or More Failures	Number of Cases	Potential Gross Requirement Reductions (Latest Acquisition Cost Total)
Zero percent	294 (31%)	$8.7M (38%)
Less than or equal to 1%	296 (31%)	$8.8M (38%)
Less than or equal to 2%	300 (32%)	$8.8M (39%)
Less than or equal to 3%	313 (33%)	$10.3M (45%)
Less than or equal to 4%	320 (34%)	$10.3M (45%)
More than 4%	623 (66%)	$12.6M (55%)
TOTALS	**943 (100%)**	**$22.9M (100%)**

Table 2-5. Potential Gross Requirements Reduction by Probability Category.

Data in Table 2-5 highlight that 31 percent of these cases have ***less than one half of one percent*** probability of experiencing one or more failures within an item's base re-supply time. That means the Air Force has (or will have if current policy remains unchanged) a base level of at least two (one in POS and one in RSP) in 294 cases that have no chance of one or more failures during an item's re-supply time. Reducing the base POS level by one on this group of items could capture 38 percent ($8.7M/$22.9M) of the potential gross requirement reduction. As the probability of one or more items failing increases, the number of cases eligible for base POS level reduction increases which also increases the potential gross requirement reduction.

Failure probabilities in Table 2-5 indicate a small percentage of C-E items with a positive base RO and a positive RSP level will not experience one or more failures within an item's base re-supply time. We need to develop a business rule to identify which items could have their base POS level reduced by one at little risk of creating a base stock-out condition.

To identify items that provide the most gross requirements reduction at the least risk we computed the probability of experiencing ***two or more failures*** within an item's base re-supply time. We performed this computation in each probability category regardless of the item's base level RO (peace and war level). Then we identified all cases in each probability category that had a three percent or greater chance of experiencing two or more failures. Remember two or more failures in an item's re-supply time could result in a C-E system being inoperable.

For cases that had a three percent or greater probability of two or more failures in each category we checked to see if their **base RO was greater than two**. This step identified items that would have at least two assets at base-level (POS level plus RSP level) ***after*** the POS level was reduced by one. Two or more assets at base level ensure two failures during an item's base re-supply time could be filled from existing base serviceable stock. The results are illustrated in Table 2-6.

		Number of Cases with 3% or Greater Probability of 2 or More Failures		
Probability of Failure	**Number of Cases with Probability of 1 or More Failures**	**Number of Cases Regardless of R/O**	**Number of Cases with Base-Level R/O of 2 or Greater**	**Number of Cases Not Covered by Base Level Assets**
Less than or equal to 1%	296	0	0	0
Less than or equal to 2%	300	0	0	0
Less than or equal to 3%	313	6	4	2
Less than or equal to 4%	320	13	8	5

Table 2-6. Number of Cases with 3% or Greater Probability of Two or More Failures.

Data in Table 2-6 show that of the 300 cases with a two percent or less chance of one or more items failing during the re-supply period, none of the cases have a three percent or greater probability of two or more failures. Therefore, based on demand history, these 300 cases have less than a three percent chance of rendering a C-E system inoperable at their applicable bases if we reduce the POS level by 1.

Raising the probability to less than or equal to three percent increases potential gross requirement reductions to 45 percent of the total potential reductions ($10.3M/$22.9M). Of the 13 additional cases (313-300) gained by increasing the probability to less than or equal to three percent, six of the cases have a three percent or greater probability of two or more failures. After the POS is reduced by one, four of these six cases will have enough assets to satisfy a second failure within the item's base re-supply time. The remaining two cases (both are operational readiness parts; designated item code 2) have only one item in POS and one item in an RSP. Both cases are located at Schriever Air Force Base. Therefore, when the POS level is reduced to zero these two items would not have sufficient base level stock to satisfy a second failure within the item's base re-supply time. This means two of these six cases have at least a three percent chance of causing a C-E system to be inoperable due to insufficient depth of base-level spares. Table 2-7 further decribes these six cases.

		Before Reduction in POS Level				
Type Item	Location	WRM Level	POS Level	Total Base Assets	DDR	PBR
SPF	Offutt AFB	3	4	7	.0029	0%
ORP	Offutt AFB	1	5	6	.0031	0%
ORP	Schriever AFB	1	2	3	.0055	0%
NSPF	Mt Home AFB,	2	1	3	.0105	0%
ORP	Schriever AFB	1	1	2	.0052	0%
ORP	Schriever AFB	1	1	2	.0055	0%

Table 2-7. Items with More Than Three Percent Chance of Two or More Failures.

Finally, the less than or equal to four percent category adds seven more cases (320-313). However, all seven new cases have at least a three percent chance of two or more failures within their base resupply time. And, three of the seven new cases do not have sufficient base level stock to satisfy a second failure within the item's base re-supply time.

By comparing the estimated gross requirement reductions and the potential risk of a base stock-out condition in each probability category **we concluded that items with three percent or less probability offer the most gross requirement reduction potential at the least risk**. The three percent or less category captures 33 percent (313/943) of the total potential cases and offers potential to reduce gross requirements by $10.3M. The potential reduction in gross requirements easily offset the minimal risk incurred.

So, we can achieve 45 percent ($10.3M/$22.9M) of the total potential gross requirements reduction at virtually no risk (only two items (operational readiness parts) have more than a three percent chance of experiencing a shortage of serviceable assets). Therefore, our proposed base stockage rule is to **reduce the base POS level by one on items with a positive base-level RO and a positive RSP level if the item's probability of experiencing one or more failures in the item's base re-supply time is less than or equal to three percent.**

PART THREE: Net Buy and Repair Requirement Reductions (Cost Avoidance Savings).

Next we compare the net reduction in the buy and repair requirements. That is, how do these gross requirements reductions reduce the current Air Force's buy and repair requirement? We used the

March 1999 CSIS data and computed the net buy and repair cost reduction with the changes in the base depot and base levels. The net cost avoidance achieved by implementing our proposed policy is $48M ($35M buy and $13M repair) when compared to the current policy (as documented in the AFCA flat file and RBL). However the "current" C-E stockage policy has not been recorded in the Air Force requirements system (D041 and the CSIS). Note the AF decided to change RBL to "over-allocate" the requirement for these critical, low-density spares. The change to RBL was made in April 1999 but the total C-E requirement (as documented in the AFCA flat file) was not completely loaded until the October 1999 RBL run. So the current C-E requirements will not be included in the Air Force requirements system until the September computation (results available in January 2000). So we also estimated the impact of implementing the new C-E policy.

We compared the gross requirement recorded in the AF requirements system (in the March 1999 CSIS) to the gross requirement resulting from the new C-E policy. The new C-E policy was approved in part because it was to reduce the total value of C-E spares required. According to our estimate, **the new C-E policy did reduce the gross requirement** (compared to the March 99 CSIS) **by $132M**. Of the 8,947 items for which the new policy generated a change from the CSIS requirement, 7,417 of those had *increased* requirements totaling $200M. A total of 985 of the 8947 items *decreased* totaling $332M.

Since reductions in one item do not offset increases in another item, we measured the net buy and repair cost of implementing the new C-E policy. The estimated buy cost (comparing the current C-E policy as reflected in the October AFCA flat file and the October RBL results to the requirement in the March 99 CSIS) is $75M and the repair cost estimate is $21M. Note the current C-E policy is the requirement RBL passed to D041 for the September computation. So the current C-E policy should be reflected in the September D041 and September CSIS (with final results available in January 2000).

Implementation of our proposals will reduce the increase in buy and repair requirement resulting from the current (recently implemented) C-E policy from $75M to $40M buy and from $21M to $8M repair. This reduction is a cost avoidance (not a cost savings), since the C-E requirements have not been completely included in the AF requirements system nor completely funded.

If our proposed policy is approved, it should be implemented as soon as possible—in the January RBL computation if possible (at least the depot floor policy change may be feasible to implement in January). Otherwise AFMC may budget and execute to the $73M buy requirement when a more accurate requirement is much less.

PART FOUR: Implementation Issues.

We propose two business rules for reducing C-E item requirement levels. The first rule involves reducing the depot floor. The most efficient method would be for RBL to determine the C-E item requirements, let RBL compute the failure probability of items and adjust the requirements accordingly, and then pass the final requirements to D041. However, RBL does not currently pass wholesale depot requirements to D041. RBL passes base ASL requirements, but there is no method to pass wholesale "additive" quantities to D041. Until a direct feed can be arranged, the RBL model can be modified to

identify which items should have their depot floor reduced to one so that the item manager can file maintain that data into D041.

It is more difficult to implement the second business rule to reduce the base POS level by one (if there is an RSP authorization and a three percent or less probability of one or more demands at that base). RBL does not currently have base RSP authorization data. So either RBL must be fed RSP data (either add an indicator to the XCB or AFCA file, add the RSP authorized quantity to the XCB to identify an item with a positive RSP level, or create an automated feed from D035C to RBL) or AFCA must use a heuristic to identify the items meeting the business rule criteria and disapprove the ASL request for those items. That is the AFCA input file to D041 will not include an ASL for items meeting the RSP business rule.

The most exact method of implementing the second business rule is to modify RBL to accept RSP authorization data and compute an item's failure probability. Until the RBL model can be modified, AFCA personnel need a robust method to select an overwhelming majority of the stock numbers that should be reduced at the base level. This method must also guard against selecting items that would otherwise be too risky to reduce at the base level (over 3% chance of a demand). Daily demand rate (DDR) is accessible by AFCA, and is a key variable in the probability calculations. As such, DDR is the variable that drives this method. It also passes the robust litmus test.

Using a DDR of less than .0025 as a filter selects over 90 percent of the items that fit the business rule and therefore are reduction candidates. Using a DDR of less than .0025 is also robust in the sense that items that have a greater than 3 percent chance of one or more demands during a base re-supply time will not be selected. Table 2-8 provides an example that demonstrates this methodology.

Using DDR less than .0025	**Reduce POS Level**	**Not Reduce POS Level**
Should Reduce Stock	Correct (294)	Incorrect (0)
Should not Reduce Stock	Incorrect (19)	Correct (630)

Table 2-8. Number of Cases the Heuristic Correctly Levels.

Data in Table 2-8 reveal that using a DDR of less than .0025 as a cutoff point does not identify all cases when a POS level should be reduced (excludes 19 cases, worth $1.5M). However, by using a DDR of less than .0025 we ***don't include any cases with a failure probability of more than three percent.*** So AFCA can use this heuristic to review and approve (or disapprove) ASLs for bases that have an RSP authorization.

Below is a summary of actions needed to implement the two proposed new leveling policies:

- AFLMA must modify the RBL model to identify which item will have a depot floor of 1 and with each RBL run provide the list of wholesale depot requirements to D041 (preferably for automated input to D041)
- SSG/ILS must include RSP (and other additive) levels on the input transaction to RBL (XCB)

- AFMC/LGI must modify the RBL data base to accept and store the RSP (and other additive) levels
- AFLMA must modify the RBL model to determine base levels for C-E items based on RSP levels at the base
  - In the interim, AFCA can use the recommended heuristic to review and approve ASLs

While conducting our analysis, we discovered that currently D041 does not provide "additive" worldwide requirement data to RBL. RBL allocates the worldwide operational intermediate maintenance (OIM) and production depot maintenance (PDM) requirements to bases, yet it appears some of the worldwide requirement is not passed to RBL. We don't think this invalidates any RBL levels, because we think (we are checking) the only items with *POS OIM and PDM additives* are insurance, numerical stockage objective and no-compute items, that is mostly C-E items. And RBL will "overallocate" the requirement for C-E items. Lack of the full requirement may impact what RBL identifies as problem items (insufficient worldwide requirements), but RBL will still push the correct level. The Air Force Requirements Team will look into the impact of not passing any POS OIM and PDM requirement to RBL. However, AFMC should develop some way to pass the applicable additive requirements to RBL. This additive requirement field may provide a method for RBL to pass the wholesale depot floor requirement from RBL to D041 as well. We talked to AFMC/LGI and they are working to develop a method to pass the applicable additive data to RBL.

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CHAPTER 3

CONCLUSIONS, RECOMMENDATIONS AND SPONSOR AGREEMENT

CONCLUSIONS

1. Reducing the depot floor from two to one on selected communications-electronics items could reduce the gross requirement by approximately $113.2 million with little, if any, affect on mission capability of supported systems.
2. Reducing the base peacetime operating stock level by one on selected communications-electronics items with base readiness spares authorizations could reduce the gross requirement by approximately $10.3 million with little, if any, affect on mission capability of supported systems.
3. The RBL data feed (the XCB) needs to be modified to include readiness spares package (and other additive) levels.
4. The Air Force needs a reliable automated method of passing computed communications-electronics item requirements from RBL to D041.
5. Additional requirements reductions may be possible by centralizing base stock levels for selected low demand, high reliability items.

RECOMMENDATIONS

1. Approve and implement a policy to reduce the depot floor from two to one on communications-electronics items with a positive base-level requisitioning objective **and** a 10 percent or less probability of two or more failures during the item's depot repair cycle time. **OPR: AFCA/GCS and HQ USAF ILS OCR: AFMC/LGI and AFLMA/LGS**
2. Approve and implement a policy to reduce the base peacetime operating stock level by one on communications-electronic items with a positive base-level requisitioning objective, a positive readiness spares package level and a three percent or less probability of one or more failures during the item's base re-supply time. **OPR: AFCA/GCS and HQ USAF ILS OCR: AFMC/LGI and AFLMA/LGS**
3. Modify RBL and the XCB transaction to record base readiness spares package and other additive levels. **OPR: AFMC/LGI and SSG/ILS**
4. Develop an automated method to feed wholesale communications-electronics item requirements from RBL to D041. **OPR: AFMC/LGI**
5. Develop an automated method to feed the policy directed wholesale stock levels from D041 to RBL. **OPR: AFMC/LGI**
6. Task the AFLMA to explore centralization of base stockage and other alternatives to reduce requirements for selected low demand, high application items. **OPR: HQ USAF/ILS and AFCA/GCS. OCR: AFLMA/LGS**

SPONSOR AGREEMENT

AFCA/GCS verbally agreed (and HQ USAF/ILS concurred) to reduce the depot minimum level on items meeting the following criteria:

1. ORP items (DIC=2) with five percent or less probability of two or more worldwide failures within the item's depot repair cycle time
2. JTA items (DIC=3) and NSPF items (DIC=4) with 10 percent or less probability of two or more worldwide failures within an item's depot repair cycle time.
3. All missile system spares (BP-25) items, regardless of designated item code, with 10 percent or less probability of two or more worldwide failures within an item's depot repair cycle time.

We estimate the net buy and repair cost avoidance realized by reducing the depot level on the items described above as $25.0M ($19.0M buys and $6.0 M repairs). Table A-2 in Appendix A identifies the cost avoidance by DIC code.

AFCA personnel are further investigating the potential impact of reducing depot levels on SPF items. At this time they are researching items and systems affected by reducing the depot level by one on only those SPF items that have .5 percent probability of two or more failures during their depot RCT. Using .5 percent failure probability as the cutoff point for SPF items would result in buy and repair cost avoidance of just over $15.0M ($11.4M in buys and $3.9M in repairs).

And finally, AFCA personnel are also further investigating the impact of reducing base POS levels at bases that have POS and RSP authorizations. Again, they are reviewing the individual items involved and the impact a base level reduction would have on the systems being supported.

DISTRIBUTION: Refer to attached Standard Form 298.

APPENDIX A

REDUCTIONS WHEN COMPARED TO CURRENT AFCA POLICY

Tables A-1 through A-5 show the buy and repair cost avoidance achieved by reducing the depot floor from 2 to 1 on items using several different options. For example Table A-1 shows that by reducing the depot floor for DIC 3 and 4 items (JTA and non-SPF) with less than a 10 percent chance of 2 or more failures and DIC 2 items with less than .5 percent (basically 0) chance of 2 or more failures avoids $18.5M in buys. The next option (Table A-2) is to increase the DIC 2 items to include up to 5 percent chance of 2 or more failures. That increases buy reductions to $19M. Table A-3 shows what we believe to be the "at least" option, meaning we should reduce the depot level on at least those items meeting these criteria. That being DIC 1 and 2 items at .5 percent and DIC 3 and 4 items at 10 percent. This criteria produces a buy cost avoidance of $29M. This option says for those items with base levels well exceeding the worldwide expected annual demand, we should not buy 2 items (we should only have 1 item) to keep at the depot. The DIC 1 and 2 items in the .5 percent category have lots of base levels and have at most 1 or 2 demands worldwide in the last 1.5 years. Tables A-5 and A-6 provide examples of these items. The items in Table A-5 are DIC 1 items with levels allocated to bases and a very low worldwide DDR. Why would we need more than 1 at the depot? Table A-6 shows DIC 2 items that have multiple base levels and 0 worldwide demands. The same question applies...Why stock more than one at the depot? Basically what we are saying is, if there is virtually no demand worldwide, only stock 1 spare at the depot in addition to the base levels for DIC 1 and 2 items. Excluding DIC 1 items means we don't "save" $11M that by all logic should be saved.

Bottom line...our depot level reduction proposal (Table A-4) has a potential buy cost avoidance of $32.1M and what we consider the "least acceptable" buy cost avoidance was $29.9M. So the "least acceptable" will get most of the potential cost avoidance.

SCENARIO A	BUY	REPAIR
DICs 3 & 4 @10%	$3.0M	$1.5M
DIC 2 @ .5%	$15.5M	$3.8M
TOTAL	$18.5M	$5.3M

Table A-1. Scenario A

SCENARIO B	BUY	REPAIR
DICs 3 & 4 @10%	$3.0M	$1.5M
DIC 2 @ 5%	$16.0M	$4.5M
TOTAL	$19.0M	$6.0M

Table A-2. Scenario B

SCENARIO C	BUY	REPAIR
DICs 3 & 4 @10%	$3.0M	$1.5M
DIC 2 @ .5%	$15.5M	$3.8M
DIC 1 @ .5%	$11.4M	$3.9M
TOTAL	$29.9M	$9.2M

Table A-3. Scenario C

SCENARIO E	BUY	REPAIR
DICs 1, 2, 3 & 4 @10%	$32.1M	$10.9M

Table A-4. Scenario D

Worldwide DDR	Sum of Base Levels	Expected Annual Demands
.0027	9	1
.0027	17	1
.0030	8	1
.0056	4	2
.0033	6	1
.0027	18	1
.0027	10	1

Table A-5. Single Point Failure Items with Low Worldwide DDR and Positive Retail Levels.

Worldwide DDR	Sum of Base Levels	Expected Annual Demands
.0000	4	0
.0000	4	0
.0000	32	0
.0000	23	0
.0000	22	0
.0000	21	0
.0000	22	0
.0000	26	0

Table A-6. Operational Readiness Parts with 0 Worldwide DDR and Positive Retail Levels.